Claims

What is claimed is:

1. A method for etching a semiconductor die, the method comprising:

providing a semiconductor die having an exposed surface disposed between first and second edges;

flowing an etchant across the exposed surface from the first edge to the second edge to thin the semiconductor die.

2. The method of claim 1, wherein the etchant comprises a mixture of nitric acid, hydrofluoric acid, and acetic acid.

3. The method of claim 1, wherein the etchant flows across the exposed surface at a rate of at least 0.7 meters/second.

4. The method of claim 1, wherein the flow of the etchant across the exposed surface is turbulent.

5. The method of claim 1, wherein the flowing the etchant is performed in a sealed chamber.

6. The method of claim 1, further comprising flowing an acidic solution across the exposed surface from the first edge of the exposed surface to the second edge of the exposed surface to at least partially remove oxide on the exposed surface.

7. The method of claim 1, further comprising flowing an acidic solution across the exposed surface from the first edge of the exposed surface to the second edge of the exposed surface to at least partially remove oxide on the exposed surface, wherein the acidic solution comprises hydrofluoric acid, the flowing the acidic solution preceding the flowing the etchant.

8. The method of claim 1, further comprising flowing an acidic solution across the exposed surface from the first edge of the exposed surface to the second edge of the exposed, wherein the flowing the acidic solution is subsequent to the flowing the etchant.

9. The method of claim 1, further comprising flowing an acidic solution across the exposed surface from the first edge of the exposed surface to the second edge of the exposed surface, wherein the flowing the acidic solution is subsequent to the flowing the etchant, wherein the acidic solution comprises hydrofluoric acid and nitric acid.

10. The method of claim 1, wherein the flowing the etchant further comprises flowing a layer of etchant across the exposed surface from a first edge of the exposed surface to a second edge of exposed surface to thin the semiconductor die, the layer having a thickness less than about 0.5 millimeters.

11. The method of claim 2, further comprising mixing the nitric acid, hydrofluoric acid, and acetic acid in a spherical mixing chamber before flowing the etchant across the die second surface.

12. The method of claim 1, wherein the semiconductor die further comprises an unexposed surface at least partially disposed within an encapsulant, the exposed surface being exposed through a cavity formed in the encapsulant.

13. A method for etching a semiconductor die, the method comprising:

providing a semiconductor die having opposing first and second surfaces;

flowing a first acidic solution across the second surface of the semiconductor die to at least partially remove oxide on the die second surface;

flowing an etchant across the die second surface from a first edge of the second surface to a second edge of second surface to thin the semiconductor die;

flowing a second acidic solution across the second surface of the semiconductor die to at least partially polish the second surface of the semiconductor die.

14. The method of claim 13, wherein the etchant comprises a mixture of nitric acid, hydrofluoric acid, and acetic acid.

15. The method of claim 13, wherein the etchant flows across the die second surface at a rate of at least 0.7 meters/second.

16. The method of claim 13, wherein the flow of the etchant across the die second surface is turbulent.

17. The method of claim 13, wherein the flowing the etchant is performed in a sealed chamber.

18. The method of claim 13, wherein the first acidic solution further comprises hydrofluoric acid.

19. The method of claim 13, wherein the second acidic solution comprises hydrofluoric acid and nitric acid.

20. The method of claim 13, wherein the flowing the etchant further comprises flowing a layer of etchant across the die second surface from a first edge of the second surface to a second edge of second surface to thin the semiconductor die.

21. The method of claim 13, wherein the semiconductor die further comprises an unexposed surface disposed within an encapsulant, the exposed surface being exposed through a cavity formed in the encapsulant.

22. An apparatus for etching a semiconductor die, the apparatus comprising:

a first member having a support surface for supporting a semiconductor die, the semiconductor die having an exposed surface disposed between first and second edges thereof;

a second member having a first surface disposed adjacent the support such that when a semiconductor die is disposed on the support surface with the exposed surface adjacent the first surface of the second member, a channel is formed between the first surface of the second member and the exposed surface of the semiconductor die;

an input conduit in fluid communication with the channel for providing a supply of etchant to the channel for flow across the exposed surface from the first edge to the second edge.

23. The apparatus of claim 22, wherein the input conduit is formed in the second member.

24. The apparatus of claim 22, wherein the input conduit further comprises a spherical mixing chamber.

25. The apparatus of claim 22, further comprising a movable post, the first member being mounted on the post for moving the first member relative to the second member.

26. The apparatus of claim 22, further comprising an output conduit in fluid communication with the channel, wherein the input conduit is positioned adjacent the first edge of the exposed surface and the output conduct is positioned adjacent the second edge of the exposed surface to permit the etchant to pass from the input conduit across the exposed surface to the output conduit.

27. The apparatus of claim 22, wherein the input conduit further comprises a spherical mixing chamber having a supply conduit in fluid communication with the spherical mixing chamber, the supply conduit oriented tangentially to the spherical mixing chamber.

28. The apparatus of claim 22, further comprising an agitator coupled to the input conduit.

29. A method for thinning a semiconductor die at least partially disposed in a semiconductor package, the method comprising:

providing a semiconductor die having opposing active and inactive surfaces, the semiconductor die being disposed in a semiconductor package with the inactive surface being at least partially exposed through a cavity formed in the;

inserting a first surface of a first member into the cavity to form a channel between the first surface of the first member and the inactive surface of the semiconductor die;

flowing an etchant through the channel to etch the inactive surface of the semiconductor die.

30. The method of claim 29, wherein the flowing the etchant is performed in a sealed chamber.

31. The method of claim 29, wherein the etchant flows across the inactive surface of the semiconductor die at a rate of at least 0.7 meters/second.

32. The method of claim 29, wherein the etchant flows across the inactive surface of the semiconductor die in a turbulent manner.

33. The method of claim 29, further comprising flowing an oxide removing liquid across the inactive surface of the semiconductor die to remove at least a portion of any oxides disposed on the inactive surface, wherein the flowing the oxide removing liquid precedes the flowing the etchant.

34. An apparatus for etching a semiconductor die, the apparatus comprising:

a semiconductor die having opposing first and second surfaces;

means for flowing an etchant across the die second surface from a first edge of the second surface to a second edge of second surface to thin the semiconductor die.